APATL0000261

Date:Jan.24, 2008

For Messrs.Hitachi,Ltd., Consumer Business Group

CUSTOMER'S ACCEPTANCE SPECIFICATIONS

AX094B002A

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Please return 1 copy with your signature on this page for approval.

Accepted by:_____   Proposed by:_____

Date:_____

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RECORD OF REVISION

Date	The upper section : Previous revision The lower section : New revision		Summary
	Sheet No.	Page	
Jul.21,2007	IPS4PS-2611-AX094B002A-1	11-2/2	8.4 Record of the revision described on the label Added:RevC/CA Moved:Initial Rev B/BA ⇒ C/CA
	IPS4PS-2611-AX094B002A-2	11-2/2	
Nov.06,2007	IPS4PS2614-AX094B002A-2	14-2/3～3/3	Change of the position of indication and packaging labels.
	IPS4PS2614-AX094B002A-3	14-2/3～3/3	
Jan.24, 2008	IPS4PS-2611-AX094B002A-3	11-2/2	8.4 Record of the revision described on the label Added:Rev.E/EA
	IPS4PS-2611-AX094B002A-4	11-2/2	

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DESCRIPTION

The following specifications are applied to the following TFT module.
Note : Inverter for back light unit is built in this module.

Product Name : AX094B002A

General Specifications

Effective Display Area   : (H)819.60×(V)460.80   (mm)

Number of Pixels   : (H)1,366×(V)768   (pixels)

Pixel Pitch   : (H)0.600×(V)0.600   (mm)

Color Pixel Arrangement   : R+G+B Vertical Stripe

Display Mode   : Transmissive Mode
    Normally Black Mode

Top Polarizer Type   : Anti-Glare

Number of Colors   : 16,777,216   (colors)

Viewing Angle Range   : Wide Version
(Horizontal & Vertical : 178° at ϕ=0°,90°,180°,270° , CR≧10)

Input Signal   : 1-channel LVDS (LVDS:Low Voltage Differential Signaling)

Back Light   : 20 pcs. of EEFL(EEFL:External Electrode Fluoresent Lamp)

External Dimensions   : (H)877.0 x (V)516.8 x (t)55.5 max   (mm)

Weight   : Typ 9,500   (g)

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1. ABSOLUTE MAXIMUM RATINGS

1.1 Environmental Absolute Maximum Ratings

ITEM	Operating		Storage		Unit	Note
	Min.	Max.	Min.	Max.		
Temperature	0	50	-20	60	℃	1),5)
Humidity	2)		2)		%RH	1)
Vibration	-	4.9(0.5G)	-	14.7(1.5G)	m/s^2	3)
Shock	-	29.4(3G)	-	294(30G)	m/s^2	4)
Corrosive Gas	Not Acceptable		Not Acceptable		-	
Illumination at LCD Surface	-	50,000	-	50,000	1x	

Note 1) Temperature and Humidity should be applied to the glass surface of a Super-TFT module,
　　　　not to the system installed with a module.
　　　　　The temperature at the center of rear surface should be less than 70℃ on the condition of operating.
　　　　　The brightness of a EEFL tends to drop at low temperature. Besides, the life-time becomes shorter
　　　　　at low temperature.
　　2) Ta≦40 ℃······Relative humidity should be less than 85%RH max. Dew is prohibited.
　　　　Ta＞40 ℃······Relative humidity should be lower than the moisture of the 85%RH at 40℃.
　　3) Frequency of the vibration is between 15Hz and 100Hz. (Remove the resonance point)
　　4) Pulse width of the shock is 10 ms.
　　5) Long operation under low temperature may cause some portion of display area to be reddish for
　　　　several minutes after turning on the product.
　　　　However, it does not affect the characteristics and reliability of the product.

1.2 Electrical Absolute Maximum Ratings

(1)TFT Module　　　　　　　　　　　　　　　　　　　　　　　　Vss = 0 V

ITEM	SYMBOL	Min.	Max.	Unit	Note
Power Supply Voltage	V DD	0	13.2	V	
Input Voltage for logic	V 1	-0.3	3.6	V	1)
Electrostatic Durability	V ESD0	±100		V	2),3)
	V ESD1	±8		kV	2),4)

Note　1)It is applied to pixel data signal and clock signal.
　　　　2)Discharge Coefficient：200pF-250Ω, Environmental：25℃-70%RH
　　　　3)It is applied to I/F connector pins.
　　　　4)It is applied to the surface of a metallic bezel and a LCD panel.

(2) Back-light Inverter　　　　　　　　　　　　　　　　　　　Vss = 0 V

ITEM	SYMBOL	Min.	Max.	Unit	Note
Input Voltage	Vin	0	28.0	V	
ON/OFF Control Input Voltage	ON/OFF	-0.3	5.5	V	
Brightness Control Voltage	BRT	-0.3	5.5	V	
Error Signal Control	ERR	-0.3	5.5	V	

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2. INITIAL OPTICAL CHARACTERISTICS

The following optical characteristics are measured under stable conditions. It takes about 30 minutes to reach stable conditions. The measuring point is the cent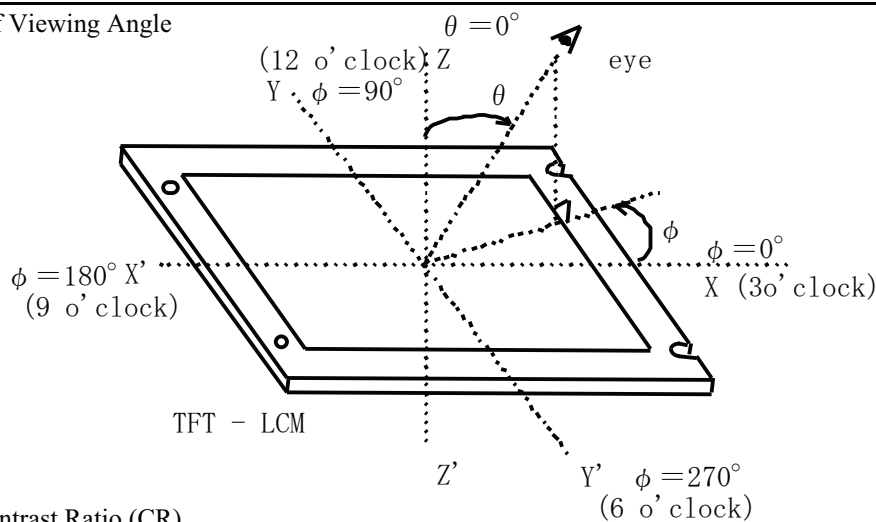er of display area unless otherwise noted. The optical characteristics should be measured in a dark room or equivalent state.

Measuring equipment : CS-1000A or equivalent

Ambient Temperature =25℃, VDD=12.0V, f V=60Hz, VBL=24V, BRT=3.3V

ITEM		SYMBOL	CONDITION	Min.	Typ.	Max.	UNIT	NOTE
Contrast Ratio		C R		600	1000	-	-	2)
Response Time	Rise	ton		-	8	20	ms	3)
	Fall	toff		-	6	20	ms	3)
Brightness of white		Bwh		420	(500)	-	cd/m^2	
Brightness control range		B$_{RNG}$		-	25	-	% of Bwh	BRT=0V
Brightness uniformity		Buni		-	-	30	%	4)
Color Chromaticity (CIE)	Red	x	$\theta=0°$ 1)	0.62	0.65	0.68	-	【Gray scale =255】
		y		0.30	0.33	0.36		
	Green	x		0.27	0.30	0.33		
		y		0.59	0.62	0.65		
	Blue	x		0.12	0.15	0.18		
		y		0.04	0.07	0.10		
	White	x		0.243	0.273	0.303		
		y		0.254	0.284	0.314		
Variation of Color Position (CIE)	Red	Δx	$\theta=+50°$ $\phi=0°, 90°$ 180°, 270° 1)	-	-	0.04	-	5) 【Gray scale =255】
		Δ y		-	-	0.04		
	Green	Δx		-	-	0.04		
		Δ y		-	-	0.04		
	Blue	Δx		-	-	0.04		
		Δ y		-	-	0.04		
	White	Δx		-	-	0.04		
		Δ y		-	-	0.04		
Contrast Ratio at 89°		CR89	$\phi=0°, 90°$ 180°, 270° 1)	10	-	-	-	Estimated value

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Note 1) Definition of Viewing Angle

$\theta = 0°$
(12 o'clock) Z   eye
Y $\phi = 90°$ θ
$\phi = 180°$ X' ϕ $\phi = 0°$
(9 o'clock)   X (3o'clock)

TFT - LCM

Z'   Y' $\phi = 270°$
(6 o'clock)
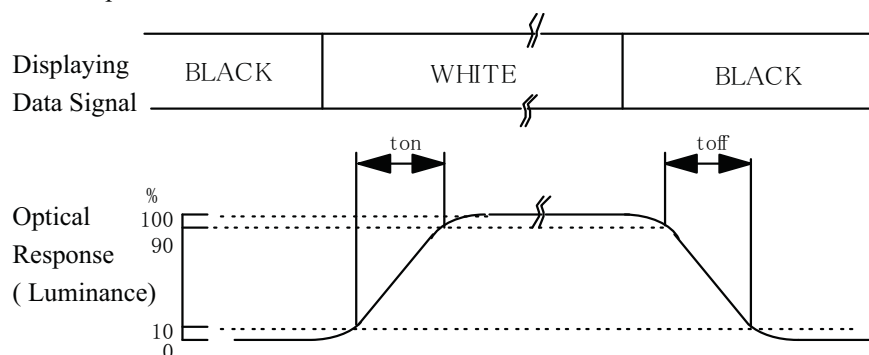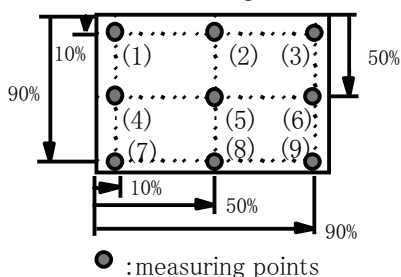
2) Definition of Contrast Ratio (CR)

$$CR = \frac{(\text{Luminance at displaying WHITE})}{(\text{Luminance at displaying BLACK})}$$

3) Definition of Response Time

| Displaying Data Signal | BLACK | WHITE | BLACK |

ton   toff

Optical Response (Luminance)

%
100
90

10
0

4) Definition of Brightness Uniformit Display pattern is white (255 level) . The brightness uniformity is defined as the following equation. Brightness at each point is measured, and average, maximum and minimum brightness is calculated.

10%   (1) (2) (3)   50%
90%   (4) (5) (6)
(7) (8) (9)
10%   50%
90%

●：measuring points

$$B_{uni} = \frac{\left| \; B_{max} \text{ or } B_{min} - B_{ave} \; \right|}{B_{ave}} \times 100$$

where, B_{max} = Maximum brightness
B_{min} = Minimum brightness

$$B_{ave} = \text{Average brightness} = \frac{\sum\limits_{k=1}^{9} (B(k))}{9}$$

5) Variation of color position on CIE is defined as difference between colors at $\theta = 0°$ and
at $\theta = 50°$ & $\phi = 0°90°180°270°$.

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3. ELECTRICAL CHARACTERISTICS

3.1 TFT-LCD Module

Ta=25℃、Vss=0V

ITEM	SYSTEM	Min.	Typ	Max	単位	備考
Power supply Voltage	V_{DD}	11.4	12.0	12.6	V	
Power supply Current	I_{DD}	-	0.55	0.70	A	1), 2)
Ripple voltage of power Supply	V_{DDR}	-	-	0.15	V	

Note 1) fV=60.0Hz，fCLK=82MHz，VDD=12.0V，and display pattern is white.

DC Ampere Meter　　TFT Module

V_{DD}

V_{SS}
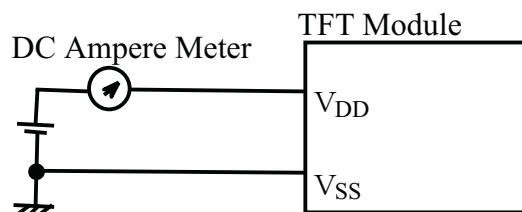
2) Current fuse is built in a module. Current capacity of power supply for VDD
should be larger than 4A, so that the fuse can be opened at the trouble of electrical circuit of module.

3.2 Back Light

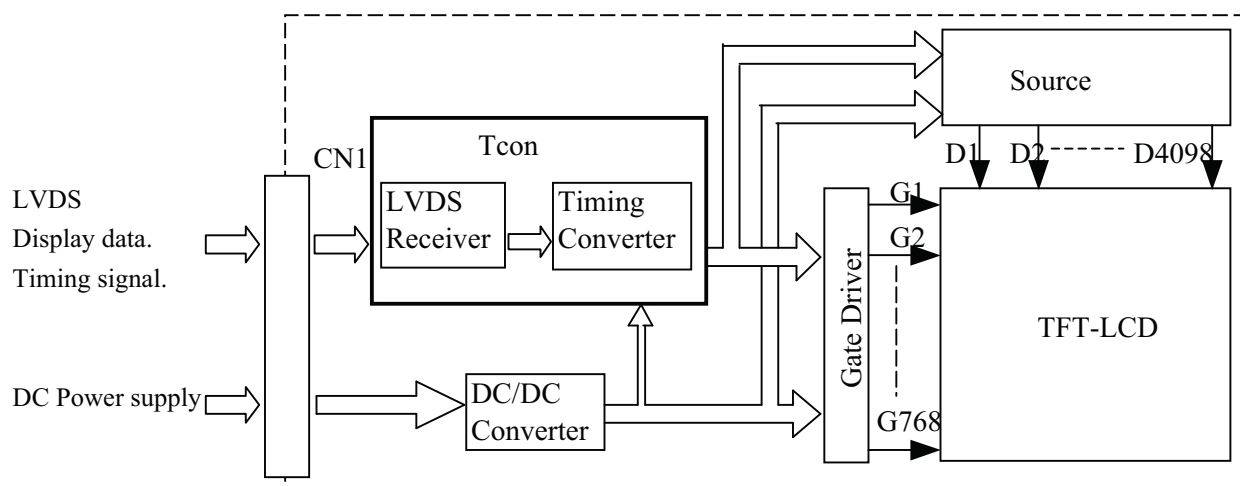| ITEM		Symbol	Min.	Typ.	Max.	Unit	Notes	
Input Voltage		VBL	21.6	24.0	26.4	V		
Input Current		IBL	-	-	6.0	A	3)	BRT=3.3V, Ta=25℃
			-	5.0	5.5		4)	
ON/OFF Control Imput Voltage	ON	ON/OFF	3.0	3.3	5.5	V	TV set side impedance : 4.7kΩ	
	OFF		-0.3	0.0	0.8	V		
Brigthness Control Input Voltage	Min. Brightness	BRT	-0.3	0	0.36	V	TV set side impedance : 1.0kΩ	
	Max. Brightness		3.135	3.3	3.465	V		
PWM Duty	Min. Brightness	on-Duty	-	20	-	%	BRT=0V	
Output Frequency		f	54.5	57.0	59.5	kHz		
Error Signal Control	Normal	ERR	Open Collector			V	Keep open while enable is on and low as long as system is abnormal.	
	Abnormal		-	0.0	0.8	V		
Average Lamp Life Time		-	50,000	-	-	hours	5)	

Note　3）Warm up period (1 hour after back light is turnd on.)
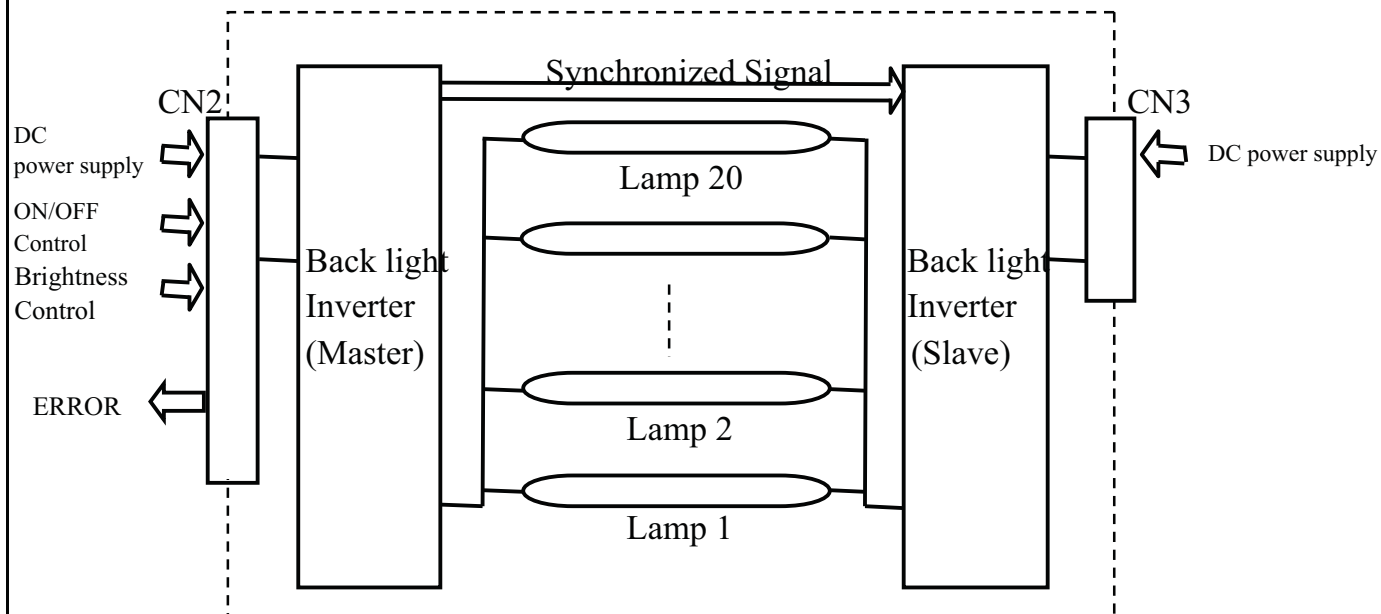　　　4）Stable period (Average of 1min after warm up period)
　　　5）Life time of a lamp is defined as the time at which brightness of the lamp is 50% compared to that of initial value
　　　　at that typical lamp current on condition of continuous operating at 25 ± 2℃.

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4. BLOCK DIAGRAM

(1) TFT Module

LVDS
Display data.
Timing signal.

DC Power supply

CN1

Tcon
LVDS Receiver → Timing Converter

DC/DC Converter

Gate Driver

Source

D1 D2 ------ D4098

G1
G2
G768

TFT-LCD

(2) Back light unit

CN2

DC power supply

ON/OFF Control

Brightness Control

ERROR

CN3

DC power supply

Synchronized Signal

Back light Inverter (Master)

Back light Inverter (Slave)

Lamp 20

Lamp 2

Lamp 1

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5. INTERFACE PIN ASSIGNMENT

5.1 TFT-LCD MODULE

CN1:FX15S-41S-0.5SH

(Matching connector : FX15S-41P-C)

PIN No.	Symbol	Description	Note
1	VDD		
2	VDD		
3	VDD	Power Supply (typ.+12V)	1)
4	VDD		
5	VDD		
6	VDD		
7	VSS		
8	VSS		
9	VSS	GND(0V)	2)
10	VSS		
11	VSS		
12	VSS		
13	Rx0-	Pixel Data	3)
14	Rx0+		
15	VSS	GND(0V)	2)
16	Rx1-	Pixel Data	3)
17	Rx1+		
18	VSS	GND(0V)	2)
19	Rx2-	Pixel Data	3)
20	Rx2+		
21	VSS	GND(0V)	2)
22	CLK-	Pixel Clock	3)
23	CLK+		
24	VSS	GND(0V)	2)
25	Rx3-	Pixel Data	3)
26	Rx3+		
27	VSS	GND(0V)	2)

PIN No.	SYMBOL	Description	Note
28	IC		
29	IC		
30	IC		
31	IC		
32	IC		
33	IC		
34	IC	Internally Connected , Keep Open	
35	IC		
36	IC		
37	IC		
38	IC		
39	IC		
40	IC		
41	IC		

Notes   1) All VDD pins shall be connected to +12.0V(Typ.).

2) All VSS pins shall be grounded. Metal bezel is internally connected to VSS.

3) Rx n+ and Rx n- (n=0,1,2,3) shall be wired by twisted-pairs or side-by-side FPC patterns, respectively.

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5. 2 BACK-LIGHT UNIT

CN2:JST S14B-PH-SM3-TF(LF)

(Matching connecor : JST PHR-14)

Pin No.	SYMBOL	Description	Note
1	VIN		
2	VIN		
3	VIN	Power Supply (typ.+24.0V)	1)
4	VIN		
5	VIN		
6	VSS		
7	VSS		
8	VSS	GND(0V)	2)
9	VSS		
10	VSS		
11	ERR	Error Signal Control	
12	ON/OFF	High:Lamp ON, Low:Lamp OFF	
13	BRT	Brightness Control	
14	IC	Internally Conected, Keep Open	

Notes 1) All VIN pins shall be connected to +24.0V(Typ.).

2) All VSS pins shall be grounded. Metal bezel is internally connected to VSS.
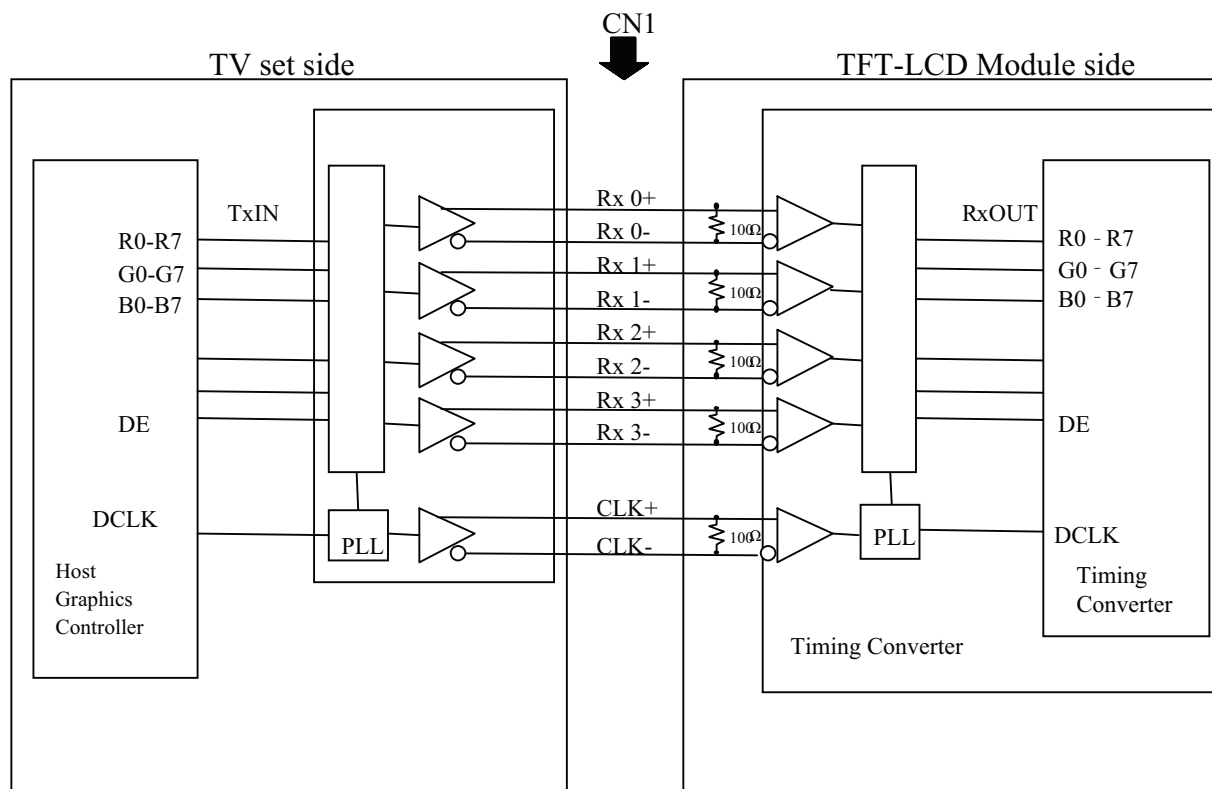
CN3:JST S12B-PH-SM3-TF(LF)

(Matching connecor : JST PHR-12)

Pin No.	SYMBOL	Description	Note
1	VIN		
2	VIN		
3	VIN	Power Supply (typ.+24.0V)	1)
4	VIN		
5	VIN		
6	VSS		
7	VSS		
8	VSS	GND(0V)	2)
9	VSS		
10	VSS		
11	NC	NC	
12	NC	NC	

Notes 1) All VIN pins shall be connected to +24.0V(Typ.).

2) All VSS pins shall be grounded. Metal bezel is internally connected to VSS.

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5.3 BLOCK DIAGRAM OF INTERFACE

CN1

TV set side — TFT-LCD Module side

R0～R7	: Pixel R Data	(7; MSB, 0; LSB)
G0～G7	: Pixel G Data	(7; MSB, 0; LSB)
B0～B7	: Pixel B Data	(7; MSB, 0; LSB)
DE	: Data Enable	

Notes 1) The system must have LVDS transmitter to drive the module.

2) LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twisted-pair line when it is used differentially.

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5.4 LVDS INTERFACE

	SIGNAL	TRANSMITTER THC63LVDM83A		INTERFACE CONNECTOR		RECEIVER		TFT CONTROL
		PIN	INPUT	TV Set	TFT-LCD	PIN	OUTPUT	INPUT
24bit	R2	51	Tx IN0	TA OUT0+	Rx 0+	27	Rx OUT0	R2
	R3	52	Tx IN1			29	Rx OUT1	R3
	R4	54	Tx IN2			30	Rx OUT2	R4
	R5	55	Tx IN3			32	Rx OUT3	R5
	R6	56	Tx IN4			33	Rx OUT4	R6
	R7	3	Tx IN6	TA OUT0-	Rx 0-	35	Rx OUT6	R7
	G2	4	Tx IN7			37	Rx OUT7	G2
	G3	6	Tx IN8	TA OUT1+	Rx 1+	38	Rx OUT8	G3
	G4	7	Tx IN9			39	Rx OUT9	G4
	G5	11	Tx IN12			43	Rx OUT12	G5
	G6	12	Tx IN13			45	Rx OUT13	G6
	G7	14	Tx IN14	TA OUT1-	Rx 1-	46	Rx OUT14	G7
	B2	15	Tx IN15			47	Rx OUT15	B2
	B3	19	Tx IN18			51	Rx OUT18	B3
	B4	20	Tx IN19	TA OUT2+	Rx 2+	53	Rx OUT19	B4
	B5	22	Tx IN20			54	Rx OUT20	B5
	B6	23	Tx IN21			55	Rx OUT21	B6
	B7	24	Tx IN22			1	Rx OUT22	B7
	HSYNC	27	Tx IN24	TA OUT2-	Rx 2-	3	Rx OUT24	not connect
	VSYNC	28	Tx IN25			5	Rx OUT25	not connect
	DE	30	Tx IN26			6	Rx OUT26	DE
	R0	50	Tx IN27	TA OUT3+	Rx 3+	7	Rx OUT27	R0
	R1	2	Tx IN5			34	Rx OUT5	R1
	G0	8	Tx IN10			41	Rx OUT10	G0
	G1	10	Tx IN11			42	Rx OUT11	G1
	B0	16	Tx IN16	TA OUT3-	Rx 3-	49	Rx OUT16	B0
	B1	18	Tx IN17			50	Rx OUT17	B1
	RSVD 1)	25	Tx IN23			2	Rx OUT23	not connect
	DCLK	31	TxCLK IN	TxCLK OUT+ TxCLK OUT-	RxCLK IN+ RxCLK IN-	26	RxCLK OUT	DCLK

RA0～RA7, RB0～RB7   :Pixel R Data (7;MSB, 0;LSB)
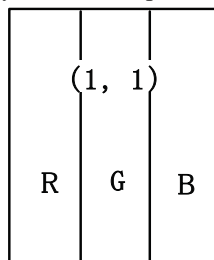GA0～GA7, GB0～GB7   :Pixel G Data (7;MSB, 0;LSB)
BA0～BA7, BB0～BB7   :Pixel B Data (7;MSB, 0;LSB)
DE   :Data Enable

Notes 1)RSVD(reserved)pins on the transmitter shall be tied to"H"or"L".
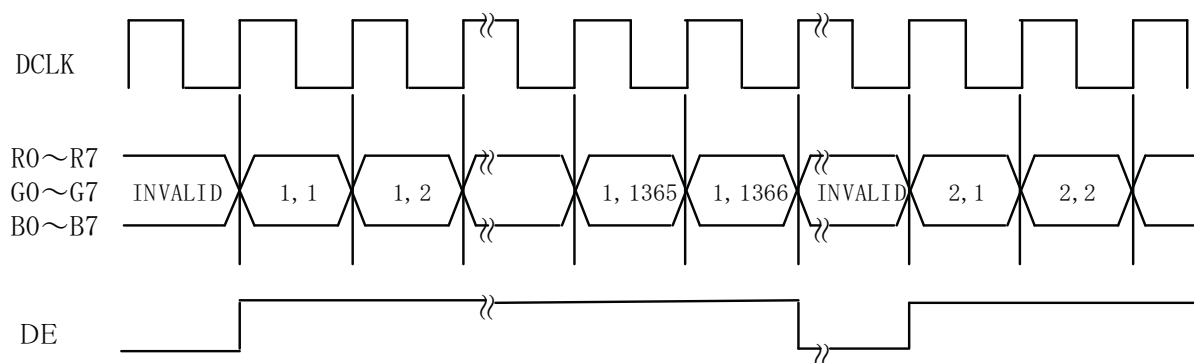
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5.5 CORRESPONDENCE BETWEEN INPUT DATA AND DISPLAY IMAGE

Display data of one pixel is latched during one cycle of DCLK.

(1，1)

R　G　B

pixel ： R0～R7 :R data
　　　　 G0～G7 :G data
　　　　 B0～B7 :B data

1, 1	1, 2	1, 3	– – – – – – – – – – –	1, 1366
2, 1	2, 2	2, 3	– – – – – – – – – – –	2, 1366
3, 1	3, 2	3, 3	– – – – – – – – – – –	3, 1366
⋮	⋮	⋮		⋮
768, 1	768, 2	768, 3	– – – – – – – – – – –	768, 1366

DCLK

R0～R7
G0～G7　INVALID　1, 1　1, 2　　1, 1365　1, 1366　INVALID　2, 1　2, 2
B0～B7

DE

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5.6 RELATIONSHIP BETWEEN DISPLAY COLORS AND INPUT SIGNALS

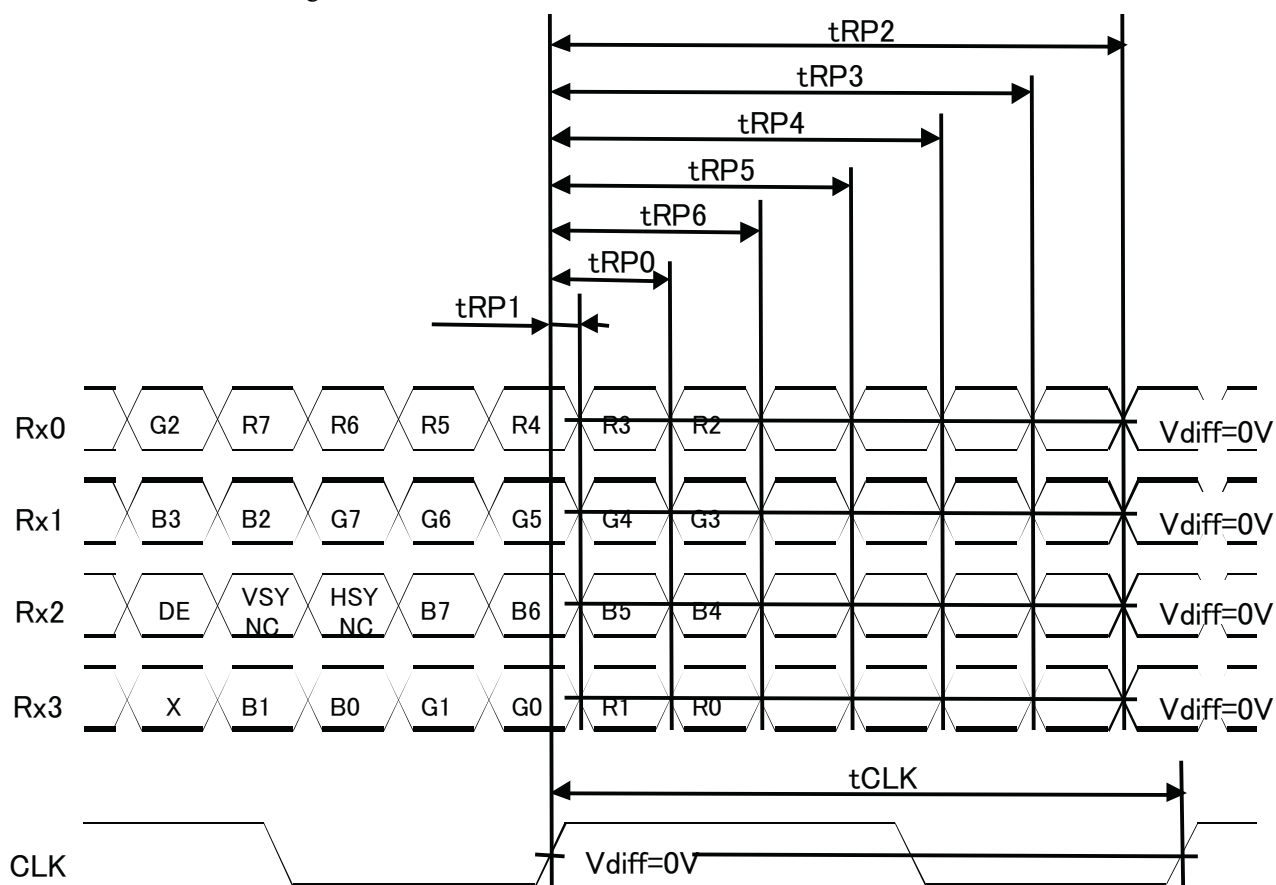| Color	Input	Red Data								Green Data								Blue Data							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
		MSB							LSB	MSB							LSB	MSB							LSB
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue (254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue (255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Notes 1) Definition of gray scale:

Color(n)・・・・Number in parenthesis indicates gray scale level. Larger n corresponds to brighter level.

2) Data: 1:High,   0:Low

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6. INTERFACE TIMING

6.1 LVDS receiver timing

Rx0 = (Rx0+) - (Rx0-)

Rx1 = (Rx1+) - (Rx1-)

Rx2 = (Rx2+) - (Rx2-)

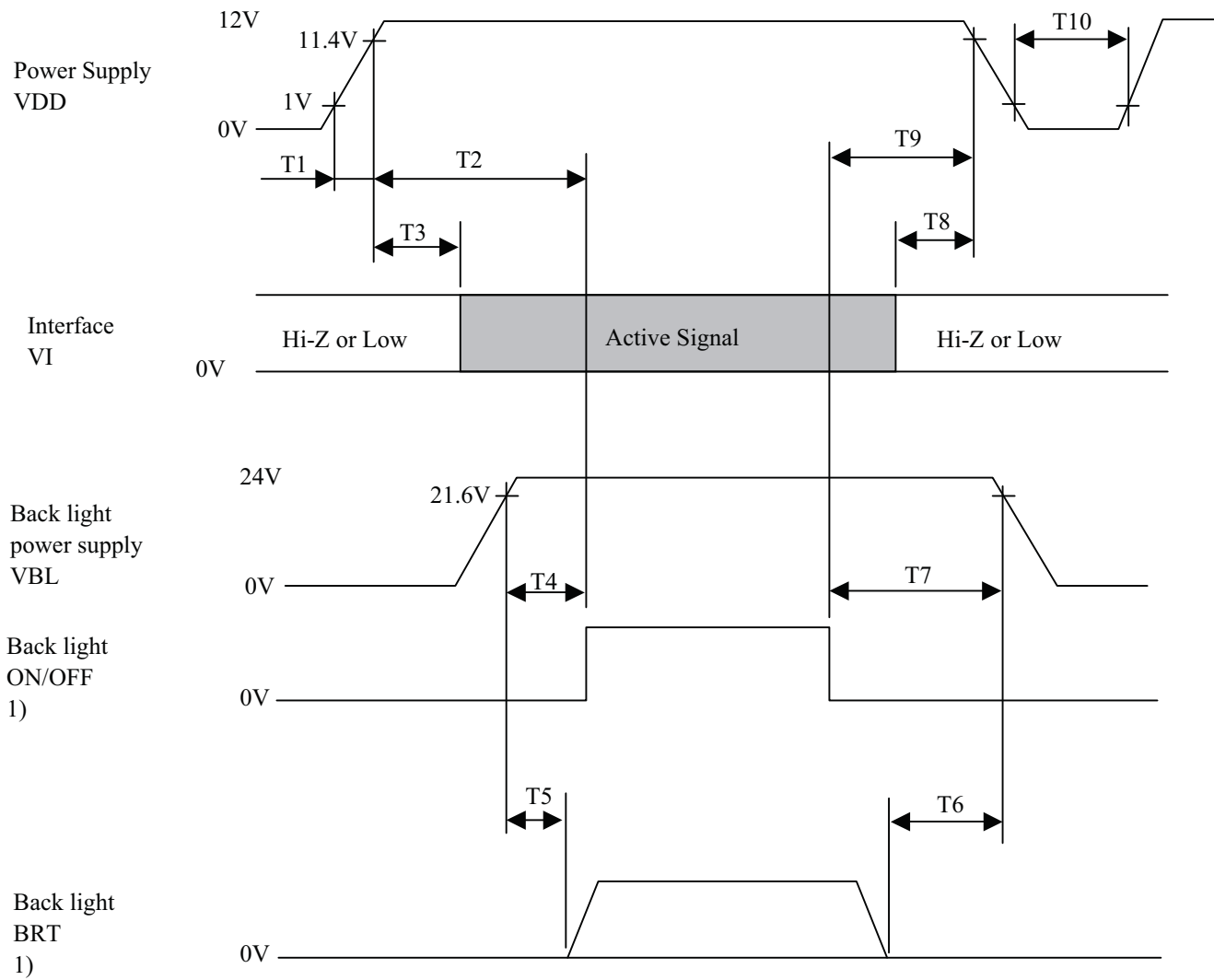Rx3 = (Rx3+) - (Rx3-)

CLK = (CLK+) - (CLK-)

	Item	Symbol	Min	Typ	Max	Unit
RCLK	Frequency	$\frac{1}{tCLK}$	65	82	85	MHz
Rx0 Rx1 Rx2 Rx3	0 data position	tRP0	1/7tCLK - 0.40	1/7tCLK	1/7tCLK + 0.40	ns
	1st data position	tRP1	- 0.40	0	+ 0.40	
	2nd data position	tRP2	2/7tCLK -0.40	2/7tCLK	2/7tCLK + 0.40	
	3rd data position	tRP3	3/7tCLK - 0.40	3/7tCLK	3/7tCLK + 0.40	
	4th data position	tRP4	4/7tCLK - 0.40	4/7tCLK	4/7tCLK + 0.40	
	5th data position	tRP5	5/7tCLK - 0.40	5/7tCLK	5/7tCLK + 0.40	
	6th data position	tRP6	6/7tCLK - 0.40	6/7tCLK	6/7tCLK + 0.40	

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6.2 SYNCRONIZATION SIGNAL TIMING
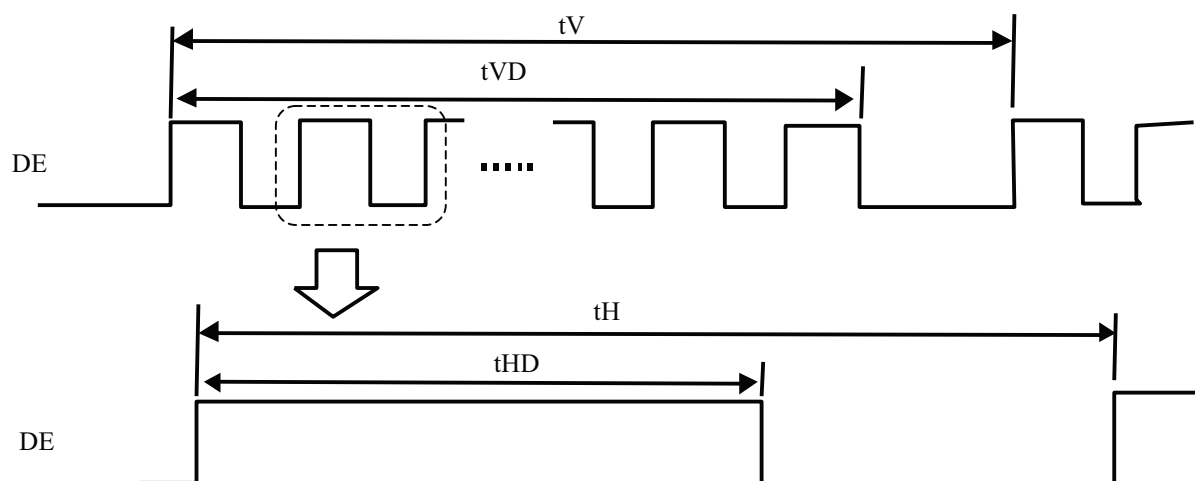
	Item	Symbol	Min	Typ	Max	Unit	Note
DE	Vertical Frequency	fV	48	60	62	Hz	
	Vertical Period	tV	784	800	1000	tH	
	Vertical Valid	tVD		768		tH	
	Horizontal Frequency	fH	41	48	49	kHz	
	Horizontal Period	tH	1410	1708	1992	tCLK	
	Horizontal Valid	tHD		1366		tCLK	

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6.3 TIMING BETWEEN INTERFACE SIGNALS POWER SUPPLY

Power Supply VDD

12V
11.4V
1V
0V
T1 T2 T3 T9 T8 T10

Interface VI

Hi-Z or Low   Active Signal   Hi-Z or Low
0V

Back light power supply VBL

24V
21.6V
0V
T4 T7

Back light ON/OFF 1)

0V

Back light BRT 1)

T5 T6

0V

0.5	$\leqq T1 \leqq$	10	
350	$\leqq T2$		
10	$\leqq T3$		
0	$\leqq T4$		
0	$\leqq T5$		

-100	$\leqq T6$	
-100	$\leqq T7$	
0	$\leqq T8$	
0	$\leqq T9$	
1000	$\leqq T10$	Unit : ms

Note 1) In all periods, the backlight ON/OFF signal voltage and the BRT signal voltage should be lower than the backlight power supply voltage.

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7. DIMENSIONAL OUT LINE
(1) FRONT VIEW
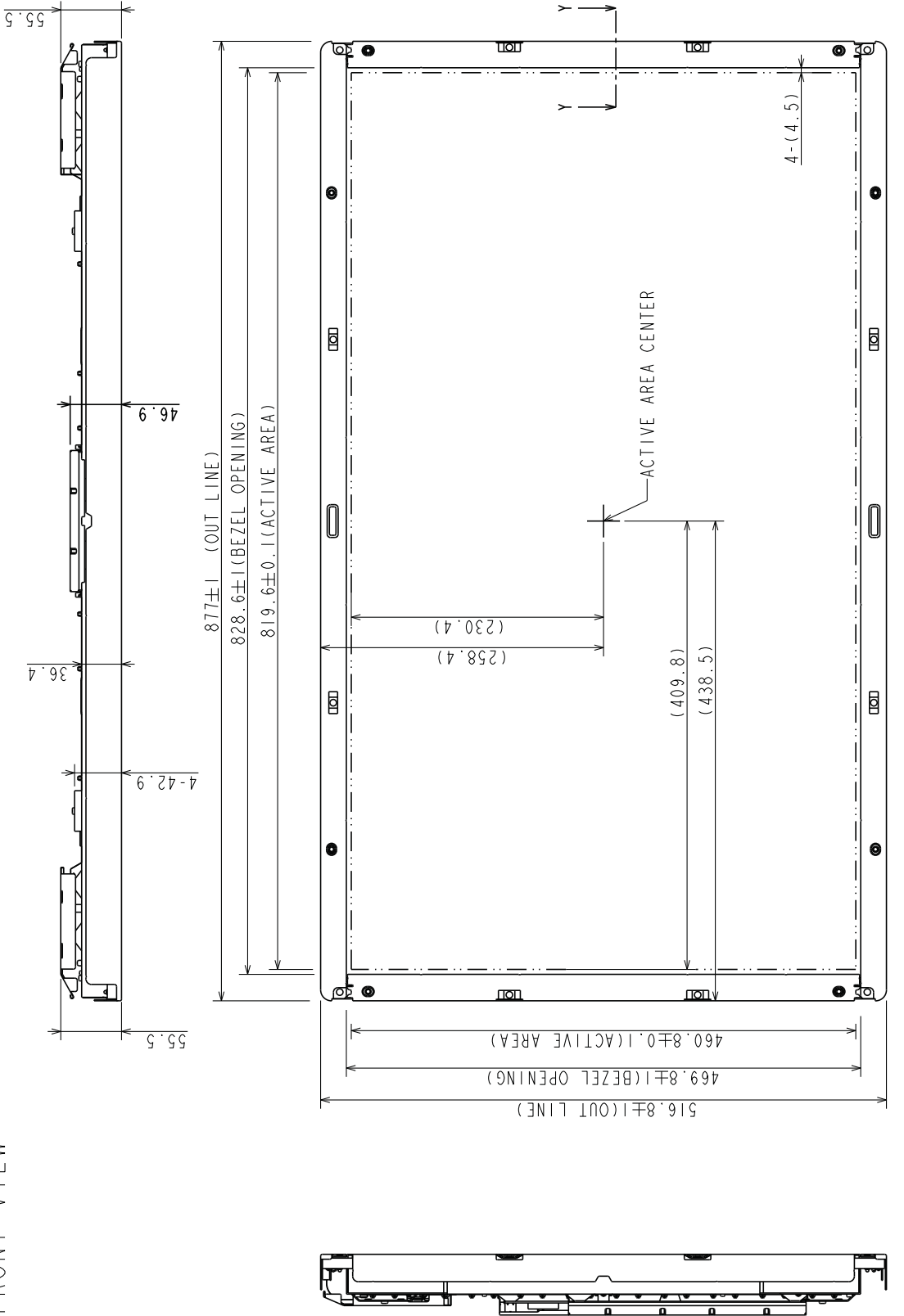
55.5

46.9

36.4

4-42.9

55.5

877±1 (OUT LINE)

828.6±1(BEZEL OPENING)

819.6±0.1(ACTIVE AREA)

Y

Y

4-(4.5)

ACTIVE AREA CENTER

(230.4)

(258.4)

(409.8)

(438.5)

460.8±0.1(ACTIVE AREA)

469.8±1(BEZEL OPENING)

516.8±1(OUT LINE)

(2.4)

SECTION Y-Y

Note 1) The dimension in a parenthesis is a reference value.
2) Unspecified tolerance to be ±1.0

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(2)BACK VIEW

[UPPER SIDE]

[LOWER SIDE]

M4 BR
USER HOLE
DP:MAX.6.0

M4 BR
USER HOLE
DP:MAX.6.0

∅6 (HT:2.0)

DETAIL A

(37)

30±0.5

(47)

(217)

(32)

(120)

LAMP SUPPORT AREA

(280)

(235)

(323)

LAMP SUPPORT
HT:(3.5)

(135)

(85)

(316.5)

IF1

IF2

(143.4)

0

530±0.5

(877)

(129)

(85)

(135)

LAMP SUPPORT AREA

(316.5)

(119.2)

(139.2)

(55)

(323)

(235)

IF2

(280)

DETAIL A

(438.5)

(120)

(95)

(280)

400±0.5

(258.4)

(516.8)

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Note 1) The dimension in a parenthesis is a reference value.
2) Unspecified tolerance to be ±1.0

8. DESIGNATION OF LOT MARK

8.1 LOT MARK

6 digits for production number
(000001～999999)

Special mark 4)

Production management sign

Week 3)

Month 2)

Year 1)
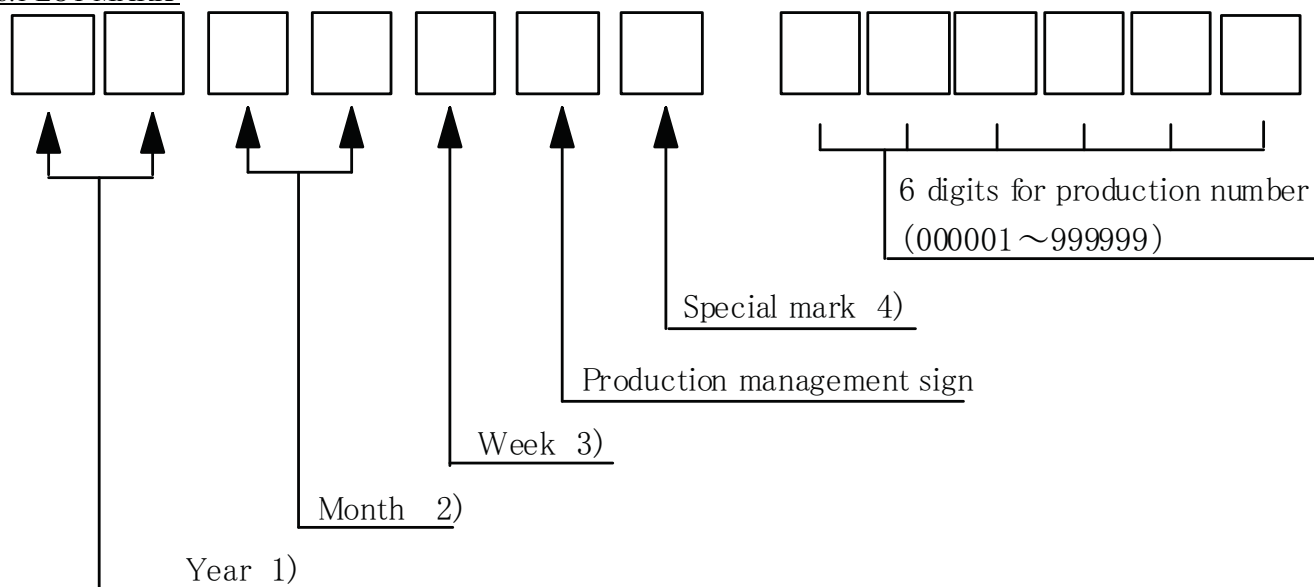
Notes

1)

Year	Mark
2007	07
2008	08
2009	09

2)

Month	Mark	Month	Mark
1	01	7	07
2	02	8	08
3	03	9	09
4	04	10	10
5	05	11	11
6	06	12	12

3)

Week(Day)	Mark
1～7	1
8～14	2
15～21	3
22～28	4
29～31	5

4) It is the mark that was opened up by production person to take
     correspondence with production number.

8.2 Revision (REV.) control

REV. is the column for manufacturing convenience. A-Z except I and O may be written
on this column.

8.3 Location of lot mark

Lot mark is printed on a label. The label is on the metallic bezel as shown in 7. External Dimensional.
The style of character will be changed without notice.

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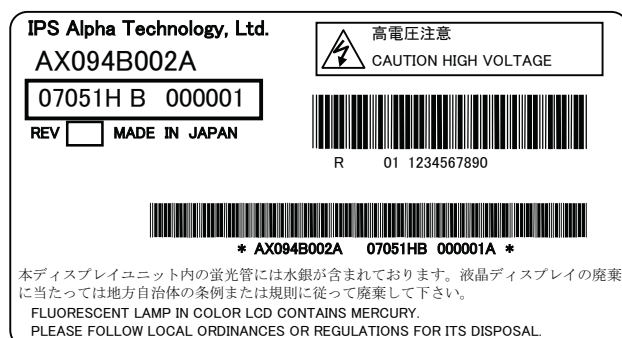
8.4 Record of the revision described on the label

Revision	Specification
B / BA	-
C / CA	Initial
E / EA	Lamp is changed based on Rev.C/CA.

Note) *A=Easing cosmetic specification of sparkle mode classified

Item	B/BA	C/CA	E/EA					
Initial	–	○						
Prevention of hum noise Diffuser Board Lamp color chromaticity		○	○					
Lighting characteristic			○					

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9. COSMETIC SPECIFICATIONS

9.1 Condition for cosmetic inspection

(1) Viewing zone

    a) The figure shows the correspondence between eyes (of inspector) and TFT-LCD module.

       $\theta \leqq 45°$: when non-operating inspection

       $\theta \leqq 5°$: when operating inspection

    b) Inspection should be executed only from front side and only A-zone. Cosmetic of B-zone and C-zone are ignore. (refer to 9.2 Definition of zone)

Inspection view

Light

about 500mm

θ θ

TFT−LCD Module
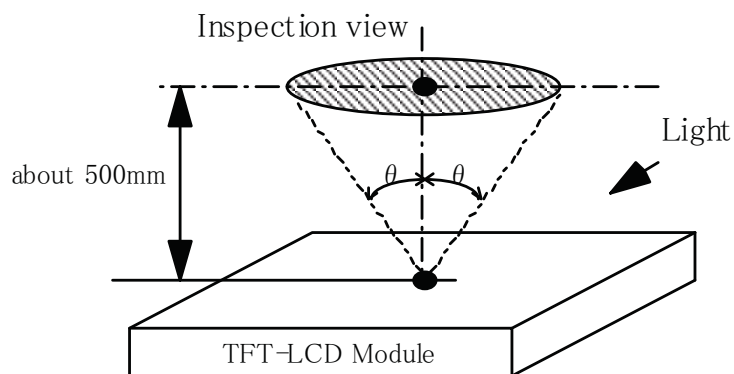
(2) Environmental

    a) Temperature : 25 degrees

    b) Ambient light : about 700 lx and non-directive when operating inspection.

                  : about 1000 lx and non-directive when non-operating inspection.

    c) Back-light : when non-operating inspection, back-light should be off .

9.2 Definition of zone

    ・A-zone : Display area (pixel area)

    ・B-zone : Area between A-zone and C-zone

    ・C-zone : Metallic bezel area

A−zone

B−zone

C−zone

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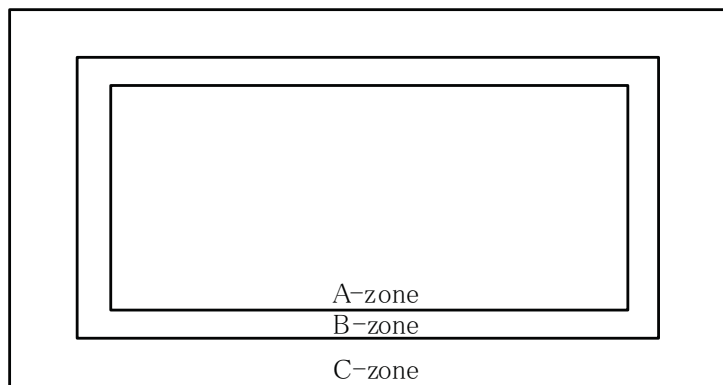
9.3 COSMETIC SPECIFICATIONS

When displaying conditions are not stable (ex. at turn on or off), the following specifications are not applied.

	No	ITEM			Max. acceptable number A-zone		Unit	Note
					Standard	Easing		
Operating inspection	1	Dot defect	Sparkle mode	1-dot	0	2	pcs	1),2),4)
				2-dots	0	0	Units	1),2),5)
				3-dots	0	0		
				Density	0	2	pcs/φ20mm	1),2),6)
				Total	0	2	pcs	1),2)
			Black mode	1-dot	5	7	pcs	1),3),4)
				2-dots	1	1	Units	1),3),5)
				3-dots	0	0		
				Density	3	4	pcs/φ20mm	1),3),6)
				Total	5	7	pcs	1),3)
				Total	5	7	pcs	1)
	2	Line defect			Serious one is not allowed		-	-
	3	Uneven brightness						
	4	Stain inclusion Line shape (W : width (mm) L : length (mm))	W≦0.02	L : Ignore	Ignore		pcs	7)
			W≦0.04	L≦4.0	8			
				L>4.0	0			
			W≦0.08	L≦2.0	8			
				L>2.0	0			
			W>0.08	-	(See dot shape)			
	5	Stain inclusion Dot shape (D : ave. dia (mm))	D≦0.22		Ignore		pcs	7)
			D≦0.5		8			
			D>0.5		0			
	6	Scratch on polarizer Line shape (W : width (mm) L : length (mm))	W≦0.02	L : Ignore	Ignore		pcs	8)
			W≦0.08	L≦20	10			
				L>20	0			
			W>0.08	-	0			
	7	Scratch on polarizer Dot shape (D : ave. dia (mm))	D≦0.2		Ignore		pcs	8)
			D≦0.6		10			
			D>0.6		0			

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	No	ITEM		Max. acceptable number	Unit	Note
				A-zone		
Operating inspection	8	Bubbles, peeling in polarizer $\left[\ D : \text{ave. dia (mm)}\ \right]$	D≦0.2	Ignore	pcs	8)
			D≦0.5	10		
			D>0.5	0		
	9	Wrinkles on polarizer		Serious one is not allowed.	-	-

Note　1) Dot defect : defect area > 1/2 dot

2) Sparkle mode : brightness of dot is more than 30% at black. (visible to eye)

3) Black mode : brightness of dot is less than 70% at white. (visible to eye)

4) 1 dot : defect dot is isolated, not attached to other defect dot.

5) N dots : N defect dots are consecutive. (N means the number of defects dots)

6) Density : number of defect dots inside 20mmϕ.

7) Those stains which can be wiped out easily are acceptable.

8) Polarizer area inside of B-zone is not applied.

9) No major (serious) defects when viewed in gray scale mode.

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10. PRECAUTION

Please pay attention to the followings when a TFT module with a back-light unit is used, handled and mounted.

10.1 Precaution to handling and mounting

(1) Applying strong force to a part of the module may cause partial deformation of frame or mold, and cause damage to the display.

(2) The module should gently and firmly be held by both hands. Never hold by just one hand in order to avoid any internal damage. Never drop or hit the module.

(3) The module should be installed with mounting holes of a module.

(4) Uneven force such as twisted stress should not be applied to a module when a module is mounted on the cover case. The cover case must have sufficient strength so that external force can not be transmitted directly to a module.

(5) It is recommended to leave a space between a module and a holding board of a module so that partial force is not applied to a module.
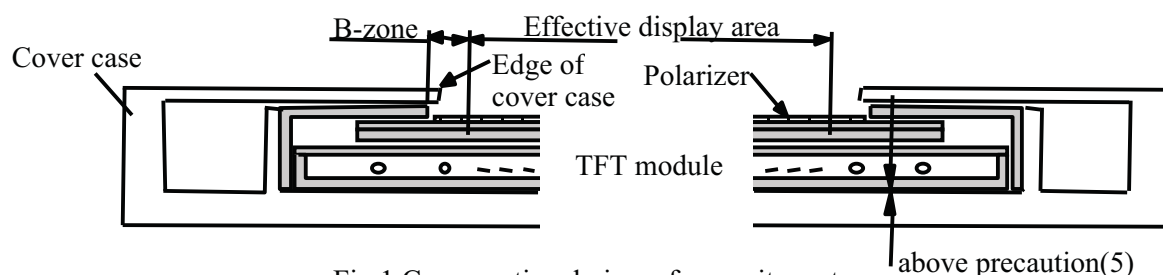
Fig.1 Cross sectional view of a monitor set

(6) The edge of a cover case should be located inside more than 1mm from the edge of a module front frame.

(7) A transparent protective plate should be added on the display area of a module in order to protect a polarizer and TFT cell. The transparent protective plate should have sufficient strength so that the plate can not touch a module by external force.

(8) Materials included acetic acid and choline should not be used for a cover case as well as other parts and boards near a module. Acetic acid attacks a polarizer. Choline attacks electric circuits due to electro-chemical reaction.

(9) The polarizer on a TFT cell should carefully be handled due to its softness, and should not be touched, pushed or rubbed with glass, tweezers or anything harder than HB pencil lead. The surface of a polarizer should not be touched and rubbed with bare hand, greasy clothes or dusty clothes.

(10) The surface of a polarizer should be gently wiped with absorbent cotton, chamois or other soft materials slightly contained petroleum benzene when the surface becomes dirty. Normal-Hexane or Isopropyl alcohol as cleaning chemicals is recommended in order to clean adhesives which fix front/rear polarizers on a TFT cell. Other cleaning chemicals such as acetone, toluen and alcohol should not be used to clean adhesives because they cause chemical damage to a polarizer.

(11) Saliva or water drops should be immediately wiped off. Otherwise, the portion of a polarizer may be deformed and its color may be faded.

(12) The module should not be opened or modified. It may cause not to operate properly.

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(13) Metallic bezel of a module should not be handled with bare hand or dirty gloves. Otherwise, color of a metallic frame may become dirty during its storage. It is recommended to use clean soft gloves and clean finger stalls when a module is handled at incoming inspection process and production (assembly) process.

(14) Lamp(EEFL) cables should not be pulled and held.

10.2 Precaution to operation

(1) The ambient temperature near the operated module should be satisfied with the absolute maximum ratings. Unless it meets the specifications, sufficient cooling system should be adopted to system.

(2) The spike noise causes the mis-operation of a module. The level of spike noise should be as follows:
-200mV<=over- and under- shoot of VDD<= +200mV
VDD including over- and under- shoot should be satisfied with the absolute maximum ratings.

(3) Optical response time, luminance and chromaticity depend on the temperature of a TFT module. Response time and saturation time of EEFL luminance become longer at lower temperature operation.

(4) Sudden temperature change may cause dew on and/or in the a module. Dew males damage to a polarizer and/or electrical contacting portion. Dew causes fading of displayed quality.

(5) Fixed patterns displayed on a module for a long time may cause after-image. It will be recovered soon.

(6) A module has high frequency circuits. Sufficient suppression to electromagnetic interference should be done by system manufacturers. Grounding and shielding methods may be effective to minimize the interference.

(7) Noise may be heard when a back-light is operated. If necessary, sufficient suppression should be done by system manufacturers.

(8) The module should not be connected or removed while a main system works.

(9) Inserting or pulling I/F connectors causes any trouble when power supply and signal dates are on-state.I/F connectors should be inserted and pulled after power supply and signal dates are turned off.

10.3 Electrostatic discharge control

(1) Since a module consists of a TFT cell and electronic circuits with CMOS-ICs, which are very weak to electrostatic discharge, persons who are handling a module should be grounded through adequate methods such as a list band. I/F connector pins should not be touched directly with bare hands.

(2) Protection film for a polarizer on a module should be slowly peeled off so that the electrostatic charge can be minimized.

10.4 Precaution to strong light exposure

(1) A module should not be exposed under strong light. Otherwise, characteristics of a polarizer and color filter in a module may be degraded.

10.5 Precaution to storage

When modules for replacement are stored for a long time, following precautions should be taken care of:

(1) Modules should be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during storage. Modules should be stored at 0 to 35℃ at normal humidity (60%RH or less).

(2) The surface of polarizers should not come in contact with any other object. It is recommended that modules should be stored in the Hitachi's shipping box.

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10.6 Precaution to handling protection film

(1) The protection film for polarizers should be pealed off slowly and carefully by persons who are electrically grounded with adequate methods such as a list band. Besides, ionized air should be blown over during peeling action. Dusts on a polarizer should be blown off by an ionized nitrogen gun and so on.

(2) The protection film should be peeling off without rubbing it to the polarizer. Because, if the film is rubbed together with the polarizer, since the film is attached to the polarizer with a small amount of adhesive, the adhesive may remain on a polarizer.

(3) The module with protection film should be stored on the conditions explained in 10.5 (1). However, in case that the storage time is too long, adhesive may remain on a polarizer even after a protection film is peeled off. Besides, in case that a module is stored at higher temperature and/or higher humidity, adhesive may remain on a polarizer. The remained adhesive may cause non-uniformity of display image.

(4) The adhesive can be removed easily with Normal-Hexane or Isopropyl alcohol. The remained adhesive or its vestige on the polarizer should be wiped off with absorbent cotton or other soft materials such as chamois slightly contained Normal-Hexane or Isopropyl alcohol.

10.7 Safety

(1) Since a TFT cell and lamps are made of glass, handling to the broken module should be taken care sufficiently in order not to be injured. Hands touched liquid crystal from a broken cell should be washed sufficiently.

(2) The module should not be taken apart during operation so that back-light drives by high voltage.

10.8 Environmental protection

(1) The TFT module contains cold cathode fluorescent lamps. Please follow local ordinance or regulations for its disposal.

(2) Flexible printed circuits and printed circuits board used in a module contain small amount of lead. Please follow local ordinance or regulations for its disposal.

10.9 Use restrictions and limitations

(1) This product is not authorized for use in life support devices or systems, military applications or other applications which pose a significant risk of personal injury.

(2) In no event shall Hitachi, Ltd., be liable for any incidental, indirect or consequential damages in connection with the installation or use of this product, even if informed of the possibility thereof in advance. These limitations apply to all causes of action in the aggregate, including without limitation breach of contact, breach of warranty, negligence, strict liability, misrepresentation and other torts.
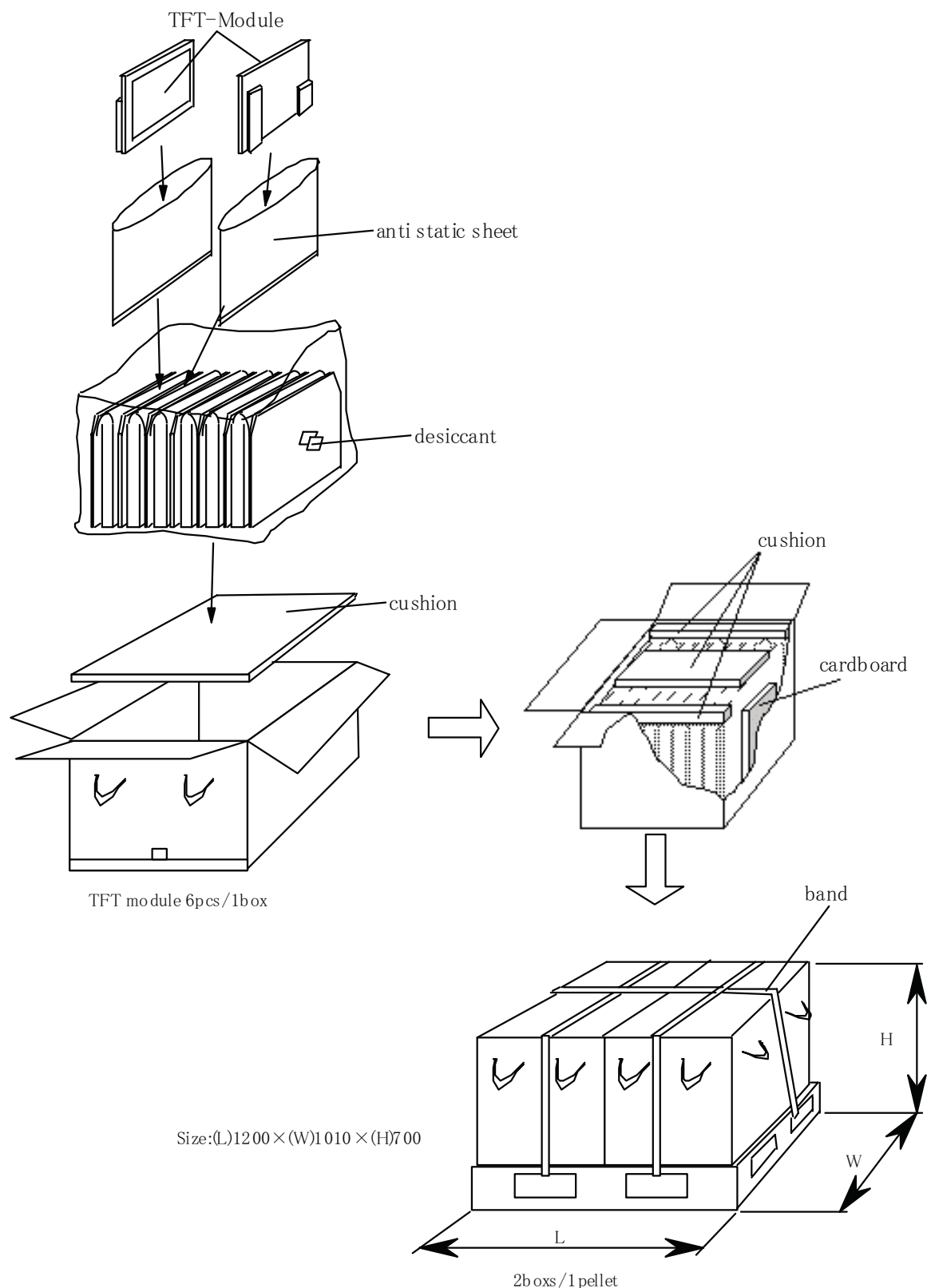
10.10 Others

(1) Electrical components which may not affect electrical performance are subjective to change without notice because of their availability.

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11.Packing

Type1 : TFT module 12pcs/pallet

TFT-Module

anti static sheet

desiccant

cushion

cushion

cardboard

TFT module 6pcs/1box

band

Size:(L)1200×(W)1010×(H)700

H

W

L

2boxs/1pellet

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Type2 : TFT module 16pcs/pallet

Upper cover
(corrugated paper)

Upper buffer material
(PS Foam)

TFT module

Turns on the back
of the TFT module.

Anti-static
electricity
bag

TFT module
(front side)

TFT module
(back side)

Parting strip
(corrugated paper)

Parting strip
(corrugated paper)

TFT module

Under buffer material
(PS Foam)

State of packing (top side view)

PE bag

Frame
(corrugated paper)

Under cover
(corrugated paper)

Plastic palett

Production ship

Address label

Wrapping indication

Band

H

(L)1220mm×(W)1000mm×(H)720mm

W

L

(TFT module 16pcs/pallete)

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Production ship

Address

Revision

quantity

IPS Alpha Technology, Ltd

F0000030R01   11

AX094B002A   6pcs

06-04-27-1   REV. A   111

6DA1S0233   6DA1S0233

6DA1S0233   F0000030R01   00008 A

Product Name

production slip (ex.)   label size (102 × 70)

発注者
(CUST)
受渡場所名
(DELIVERY POINT) E
納品キー番号 02480040003+002
(TRANS NO.)
品名コード
(PART NO.)
品名
(PART NAME)
入数／納入数量 15/   80 単位 PC
(Q TY/TOTAL Q TY) (UNIT)
受注者用備考 (CUSTOMER'S REMARKS) 包装個数 (PACKAGE COUNT)
5230 16562   D5D4T L 0   S46 45200   1SC   80402   1/ 5

(株)IPSアルファテクノロジ
AX094B002A
112C764070111601 10008401

(3N) 30248040003+002 48

(3N) 51SC-80402-16562----47-0

Wrapping indication(ex.)

ご通付先

AX094B002A

10000200   2ヶロ

10000200
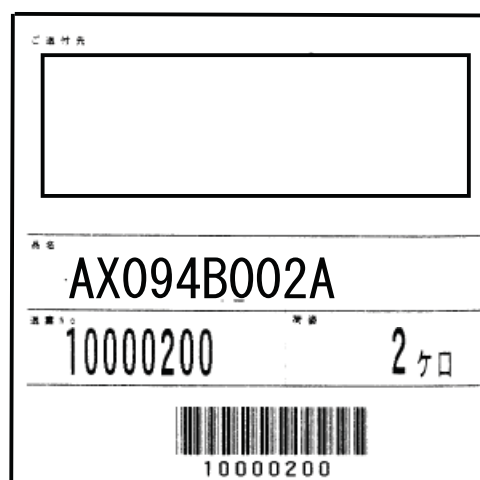
Address label(ex.)

label size (100 × 100)

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12. APPRICATION NOTE

(1) Distance between inverter cover and chassis metal

　Distance between inverter cover surface and chassis metal of TV set shall be longer than 9mm.

Chassis metal of TV set

Inverter cover

$d \geqq 9mm$

BL chassis

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